

0047

1 A. Correct.

2 Q. Okay.

3 A. I don't know if they exist.

4 Q. Okay. All right. So after you provide the seat
5 belt assembly or you provide the quote to General
6 Motors, then General Motors likely will say, yes,
7 that's what I want or, you know, maybe I need
8 something slightly different after they run
9 testing or do, you know, modeling or anything
10 like that, correct?

11 A. Correct.

12 Q. They may make changes to the request?

13 A. That's correct.

14 Q. And do you know if they made changes to the
15 request when they first asked for a quote package
16 back in 2006 or 2007?

17 A. I'm sorry, can you reask that?

18 Q. Sure. You understand when General Motors starts
19 designing a vehicle for the 2008 model year that
20 they are not going to request a quote package for
21 the 2008 model year in 2008, correct?

22 A. That's correct.

23 Q. They are going to likely go back two or three
24 years, correct?

25 A. It takes time to develop the vehicle. It starts

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1 before launch of vehicle, yes.

2 Q. Sure. And so one of the things that have to
3 develop is the restraint system for the vehicle,
4 correct?

5 A. That's correct.

6 Q. And before they ever build a prototype or design
7 a vehicle, they likely do modeling, correct?

8 A. That's correct.

9 Q. That's been your experience working with these
10 manufacturers?

11 A. Yes, it has.

12 Q. And when you provide -- when you provide the
13 quote package, did they also ask for CAD drawings
14 and modeling information from you?

15 A. Quite honestly, in the very early stages, again,
16 they pretty much modeled and have an idea of what
17 they are looking for.

18 They are more interested in us building
19 prototype parts so that we can supply parts to
20 them so that they can do the vehicle-level
21 testing to see how well their initial assumptions
22 were working.

23 Q. Okay. So they ask you for prototype parts, so
24 that -- after they accept your quote, they are
25 asking for prototype parts, not -- they are not

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1 asking are you to provide the CAD drawings of the

2 models?

3 A. Not initially, because, again, as you already
4 explained, it takes time to develop the system.
5 So we'll put -- again, they will have an idea of
6 what -- I'm going to focus on the seat belt
7 assembly portion that includes the retractor.
8 They model and know what their body-in-white
9 looks like, how it's going to be attached to the
10 vehicle, or they will use a mule vehicle or they
11 will do some sled testing with some generic
12 fixtures. And then they will ask us to be able
13 to provide parts to whichever one of those
14 scenarios, mule vehicle or sled fixture, to what
15 their system performance levels they think they
16 need. What kind of torsion bar, what kind of
17 pretensioner.

18 We'll begin preparing I'll say generic
19 drawings at the same time we're providing
20 prototype parts for their evaluation, but
21 providing models and parts generally comes later
22 after the design has been, I'll say, determined
23 or settled or satisfied where they are more
24 competent in the level of performance of the
25 parts based on the development testing they are

0050

1 doing on the overall restraint system.

2 Q. I see. So you do provide the models and
3 drawings. You just do it later?

4 A. Correct.

5 Q. After you've already provided prototypes?

6 A. Correct.

7 Q. And as the system is getting more mature, that's
8 when you provide models?

9 A. Correct.

10 Q. So when GM is running those tests, if they decide
11 that, hey, our assumptions were incorrect or our
12 assumptions we need to tweak that, they
13 communicate to you that, hey, we need something
14 slightly different, correct?

15 A. That's correct.

16 Q. And so what happens then is you go back and you
17 create a new prototype or a new model for GM and
18 give it back to GM, correct?

19 A. That's correct.

20 Q. And so while this seat belt assembly -- and we're
21 going to talk about the seat belt assembly right

22 Q. Now, you are communicating with them. I guess
23 using the term "constant" may not be appropriate,
24 but you are communicating with them throughout
25 this process?

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1 A. There's a regular cadence of product or
2 production development review meetings between
3 the Autoliv application engineering team and the

4 General Motors vehicle platform team, yes.

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1 during late 2005, 2006, 2007, prior to a 2008
 2 model year introduction. So that was twelve,
 3 thirteen years ago. I don't know.
 20 Q. You're aware that they changed the -- changed the
 21 force required on the force limiter, correct?
 22 A. Correct.
 23 Q. They did that several times throughout the life
 24 span of this vehicle, correct?
 25 A. I believe that's correct.

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11 Q. And then it has to see the load and in this case
 12 the load is three to four newtons, correct,
 13 kilonewtons?
 14 A. That's what this paper says, yes.

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1 MR. ROBINSON: That will be Exhibit 5.
 2 THE WITNESS: You marked that 5.
 3 BY MR. ROBINSON:
 4 Q. This is a twelve-page document, correct? Does it
 5 say page 1 of 12 on the front?
 6 A. Yes.
 7 Q. And if we look on the second page, it says the
 8 overall general description of changes to the
 9 vehicle. Do you see that?
 10 A. Correct.
 11 Q. It says seat belts for passenger side. Do you
 12 see that?
 13 A. I do.
 14 Q. It says, torsion bar change from 2.5 kilonewtons
 15 to 2 kilonewtons, correct?
 16 A. It does.
 17 Q. And it said the revision running change was made
 18 in November of 2010. Do you see that?
 19 A. I do.
 20 Q. And it says the rationale was to reduce chest
 21 compression for the 5th percent female during
 22 35-mile-an-hour front NCAP test. Do you see
 23 that?
 24 A. I do.
 25 Q. Did GM ever communicate to Autoliv the desire to

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1 reduce the chest compression on the 5th
 2 percentile female and ask for suggestions or ways
 3 to do that?
 4 A. My honest answer is I don't know, but they

5 obviously released an engineering change to make
6 that change from 2.5 to 2.
7 Q. I understand they did that. I'm asking what they
8 communicated to Autoliv.
9 A. There would have been an engineering work order
10 that says change the torsion bar from the
11 original torsion bar to a lower torsion bar.

0082

19 Q. Generally speaking, when Autoliv designs a seat
20 belt or an air bag, is it aware that there are
21 instances which can render an air bag inoperable?
22 MR. JENNINGS: Object to form.
23 MR. ZUCKERMAN: Likewise.
24 THE WITNESS: I'm still kind of
25 confused by the question. I mean, air bag

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1 nondeployment is not uncommon, but -- or Autoliv
2 is aware that air bags occasionally do not deploy
3 in vehicle systems. But, again, the air bag or
4 the pretensioner and any other aspect of the belt
5 or bags only respond to the inputs that it
6 receives from the restraint system control
7 module, which includes the algorithm or
8 decision-making process or sensors that are
9 developed by somebody else in General Motors.
10 So are we aware that air bags
11 occasionally don't deploy, yes, but our products
12 don't make the decision to deploy or not deploy.

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23 Q. It is foreseeable that there would be a situation
24 where an air bag would not fire to Autoliv?
25 A. I think I just answered that question, yes.

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13 Q. Let's look at something real quick. You've seen
14 NCAP tests for this vehicle?
15 A. It's a big document. I scanned through it very
16 quickly. I did not read the details of it, no.
17 Q. All right. Well, you would agree with me that a
18 35-mile-an-hour collision is a foreseeable
19 collision?
20 A. Yes.
21 Q. An NCAP test, right?
22 A. It is.
23 Q. So let's look, first of all, it's labeled Autoliv
24 240. I have an extra copy. Jim has it. There
25 you go.

0121

1 MR. JENNINGS: Page 240?

2 MR. ROBINSON: It's Autoliv 240 is the
3 -- I need to mark that. Can I borrow the front
4 page of that for a second?

5 (Exhibit 7 marked.)

6 BY MR. ROBINSON:

7 Q. If we look at page -- or Autoliv 240, we have two
8 figures on that page, correct?

9 A. Correct.

10 Q. And we see the pretest and posttest, correct?

11 A. Those are the pictures, yes.

12 Q. Pretest the seat belt is on the dummy's shoulder,
13 correct?

14 A. It is.

15 Q. And it is fairly taut, correct?

16 A. It appears to be.

17 Q. And then the seat belt in the second picture is
18 the posttest, correct?

19 A. That's correct.

20 Q. And in the first frame or the first one we can
21 see some markers on the seat belt identifying its
22 location, correct?

23 A. You mean the inch markings, the scrapes at the
24 shoulder?

25 Q. Yes.

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1 A. Yes.

2 Q. And by the time we get to the second picture
3 posttest, we don't see those at all, correct?

4 A. Correct. Don't know where they are at, but they
5 are not in view.

6 Q. They are not in view. And what we can see is
7 that the seat belt is now hanging loosely,
8 correct?

9 A. It's looser than the pretest picture, yes.

10 Q. And we see that the air bag has deployed in that
11 picture, correct?

12 A. Correct.

13 Q. What gets interesting is when we start looking at
14 the forces on the head and chest of the occupant
15 in that test.

16 MR. JENNINGS: Object to form.

17 BY MR. ROBINSON:

18 Q. If we would go to B14, it's Autoliv 265.

19 MR. ZUCKERMAN: I'm sorry, what page?

20 BY MR. ROBINSON:

21 Q. It says Autoliv 265 on the lower right-hand
22 corner. You can see the head result in Gs,
23 correct?

24 A. Yes.

25 Q. It's 49 Gs, correct?

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1 A. That's what it says, correct.

2 Q. And then if we turn a couple pages to 267, we can

3 see the chest result.
 4 A. Okay.
 5 Q. See that? That's almost 46 Gs, right?
 6 A. The chest resultant?
 7 Q. Yes, page 267. So we're between -- the head --
 8 the head is seeing 49 Gs; the chest is seeing 46
 9 Gs. If we just call it 46 Gs for the head and
 10 chest which is the portion of the torso that's
 11 going to be moving against the -- or the portion
 12 of the body weight that's going to be moving
 13 against the shoulder portion of the belt,
 14 correct?
 15 A. Correct.
 16 Q. And we assume that that's what, roughly half of
 17 the body weight of the individual? Is that a
 18 fair assumption?
 19 A. Can you repeat that again?
 20 Q. Sure. Is it fair to assume that the head and the
 21 torso portion of the dummy is about half the
 22 weight of the dummy?
 23 A. Yes, approximate.
 24 Q. Is it a little bit more, actually, than half?
 25 A. I don't have an exact value. I think you're

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1 correct approximately, but I don't know exactly
 2 what that value is.
 3 Q. If we call that 46 Gs on interacting with 50
 4 pounds, 108-pound dummy, correct? That's what a
 5 5th percentile is?
 6 A. Yes.
 7 Q. So a 50 -- or 46 Gs acting on, say, roughly 50
 8 pounds?
 9 A. Okay.
 10 Q. That's 2300 pounds, correct?
 11 A. Correct.
 12 Q. And so it's entirely foreseeable -- you agreed
 13 that the 35-mile-an-hour crash is entirely
 14 foreseeable, correct?
 15 A. Thirty-five-mile-per crashes do happen.
 16 Q. Yes. And it's entirely foreseeable that --
 17 you've agreed with me that an air bag may not
 18 deploy, correct?
 19 A. Yes.

20 MR. ZUCKERMAN: I'm going to object to
 21 the form of the question. We don't know anything
 22 about the circumstances. I shouldn't have said
 23 the extra part. I apologize. I object to form.
 24 MR. ROBINSON: That's fine. And here,
 25 I'll rephrase the question.

0125

1 BY MR. ROBINSON:
 2 Q. It's entirely foreseeable in a 35-mile-an-hour
 3 crash that for a variety of reasons an air bag
 4 may not fire, correct?

5 A. It is possible for that to occur, yes.
6 Q. And Autoliv has seen that happen?
7 A. I don't know that Autoliv has seen that happen.
8 I mean, it is possible to occur.
9 Q. Well, let me rephrase that. Autoliv has been
10 involved with cases where that has occurred?
11 A. An air bag nondeployment, yes.
12 Q. Yes, yes. It is something that Autoliv has been
13 involved with and has litigated about?
14 MR. JENNINGS: Object to the form.
15 BY MR. ROBINSON:
16 Q. Correct?
17 A. Yes.
18 Q. Now, you said that was 2300 pounds of force,
19 right?
20 A. I think that's what you said.
21 Q. And with a load limiter that you only have to put
22 600 pounds of force on, where is the dummy's head
23 and torso going?
24 A. They are moving forward.
25 Q. Towards the dash?
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1 A. They are moving forward. Where they are going is
2 not a simple answer, because there are a lot of
3 other things going on in the vehicle.
4 Q. In a frontal, pure frontal crash?
5 A. I'll repeat, they are going forward.
6 Q. In the NCAP test, if you do not have passenger
7 air bag deployment, the dummy's head and torso
8 are moving towards the dashboard, are they not?
9 A. They are moving forward, yes.
10 Q. Yes. And they will continue moving forward as
11 long as that load is placed on the belt, correct?
12 A. As long as the load exceeds the load-limiting
13 value of the retractor, the retractor will
14 continue to pay out webbing at that controlled
15 rate, yes.
16 Q. And so as long as it exceed 600 pounds, it's
17 going to continue to pull out that load, correct?
18 A. Correct.
19 Q. And it's going to continue to do so in a
20 35-mile-an-hour NCAP test until something arrests
21 the head and torso of the dummy, correct?
22 A. Correct.
23 Q. And so if the air bag isn't there, the only thing
24 to arrest the head and torso of the dummy is the
25 dashboard.
0127
1 MR. ZUCKERMAN: Object to form.
2 THE WITNESS: It's possible.
3 BY MR. ROBINSON:
4 Q. What else is there?
5 A. It depends on the position of the dummy.
6 Q. Well, that's an interesting question, because the

7 NCAP test gives you a very specific position of
8 the dummy, doesn't it?

9 A. No. At the start of the test it does.

10 Q. Yes.

11 A. But how the dummy moves during a crash event is
12 not always easily predictable.

13 Q. Well, the head and torso of that dummy are going
14 to move forward against that belt and are going
15 to continue to pull that belt out until such time
16 as something arrests the head and torso. Am I
17 correct?

18 A. Yes.

19 Q. And only thing in front of the head and torso if
20 you don't have an air bag is the dashboard?

21 MR. ZUCKERMAN: Object to form.

22 THE WITNESS: In general terms, yes.

23 BY MR. ROBINSON:

24 Q. And so the head and torso are going to go into
25 the dashboard if there's no air bag.

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1 MR. JENNINGS: Object to form.

2 BY MR. ROBINSON:

3 Q. Correct?

4 A. It's possible.

5 Q. And Autoliv was aware of this before it released
6 the seat belt in 2012? I guess, actually, let me
7 strike that.

8 Released the seat belt in 2011.

9 A. Well, I honestly don't know what Autoliv was
10 aware of or with this specific vehicle an
11 application.

12 Again, in general terms, if there's no
13 air bag an occupant will continue to move. But

0151

1 BY MR. ROBINSON:

2 Q. So can we agree that assuming that the air bag
3 does not fire in that NCAP test and that the
4 dummy's head, torso, and neck, the only thing in
5 front of it to stop it is the dashboard, correct?
6 That's what's going to be there to stop them,
7 correct?

8 A. Correct.

9 Q. I'm not going to ask you to be an expert
10 biomechanist, an expert anything. I'm not going
11 to ask you to tell me what injury values you're
12 going to get. I'm just going to ask you to use
13 your background with the engineering. You had to
14 take a lot of physics to be an engineer, right?

15 A. Yep.

16 Q. Yes. And Newton's laws of motion say that an
17 object in motion is going to remain in motion
18 until acted upon but an outside force, right?

19 A. Correct.
20 Q. Now, the only outside force, if that seat belt is
21 spooling out because it only requires 600 pounds
22 of force to pull out and you have 2300 pounds of
23 force acting on it, the only thing to stop it is
24 whatever is in front of the person or the dummy,
25 correct?

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1 A. That's correct, but I'm also going to repeat what
2 I mentioned earlier that based on the basic
3 physics of the crash where you start at an
4 initial velocity of -- relative velocity of zero,
5 you reach a peak lower acceleration and as energy
6 is being absorbed, the velocity slows down.

7 So while you may contact that dashboard
8 in front of you, I have no way to know or predict
9 at what speed or what force or what injury-level
10 criteria contact may or may not occur. I've
11 never seen this vehicle being tested without an
12 air bag.

13 I would assume that the occupant is
14 going to move further than it does without an air
15 bag. But, yes, dashboard is in front of you.
16 Potentially you contact the dashboard. I don't
17 know if that means injury.

0153

1 bag. It's a lot of other things in the car and
2 they are designed to work together.

3 So the seat belt is doing exactly what
4 was specified and asked of it to do. It locks.
5 It initially restrains the occupant. It provides
6 a load-limiting force to that occupant for as
7 long as that force level is applied and is not a
8 failure of the seat belt assembly. It's doing
9 what it's designed to do.

10 Q. That is not the question I asked. I asked about
11 the system. I understand that the entire system
12 has to work together. I understand that's what
13 your position is. My question is, can we agree
14 that if an occupant hits her head sufficient to
15 cause fatal injuries into a dashboard because her
16 air bag didn't deploy and she didn't get the full
17 benefit of the full system that the restraint
18 system failed her?

19 MR. JENNINGS: Object to the form of
20 the question. If you can answer, go ahead.

21 THE WITNESS: If there was no air bag
22 deployment, the restraint system as an overall
23 occupant protection device did not do what it was
24 originally designed to do.

0166

1 in most vehicle manufacturers' owner's manuals.

2 Q. Do you know if it's in this one?

3 A. I believe from the General Motors deposition, he
4 said that it was.

5 Q. Have you read this owner's manual?

6 A. I personally have not.

7 Q. Can you and I agree that there are design options
8 available to Autoliv and to GM that can limit the
9 total amount of webbing that can pay out in a
10 wreck?

11 A. There are designs that will limit the amount of
12 webbing payout, yes.

13 Q. And Autoliv has some of those, correct?

14 A. I'm sorry, I'm sorry. I have a cramp. I
15 apologize.

16 MR. ROBINSON: Let's take a quick
17 break.

18 VIDEO OPERATOR: Off the record at
19 3:23 p.m.

20 (Off the record.)

21 VIDEO OPERATOR: Back on the record.
22 The time is 3:26 p.m.

23 BY MR. ROBINSON:

24 Q. Sir, before we went off the record I was asking
25 you about ways that you could limit the webbing

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1 payout of this torsion bar or a torsion bar, and
2 one of the ways you can do that is to put just a
3 stop on the torsion bar after a certain point of
4 webbing. You just stop it and don't allow any
5 more webbing to come out, correct?

6 A. There's a device called a stopper mechanism. It
7 doesn't act directly on the torsion bar, but,
8 yes, you can limit the number of turns on the
9 spindle.

10 Q. Another way you can limit the amount of webbing
11 payout is to use a stronger torsion bar, correct?

12 A. That's correct.

13 Q. And then we've already talked about it a little
14 bit, but the feature that was in 2008 would be the
15 digressive feature would be one way to stop it
16 also, correct?

17 A. It doesn't stop webbing payout. It just changes
18 the load-limiting characteristic with a higher
19 restraint force at the beginning and slightly
20 lower restraint force at some point during the
21 event.

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1 Q. Did Autoliv ever tell GM that that's the -- that
2 the limits on this force limiter that the limit
3 to the amount of spool-out is the amount of

4 webbing on the spool?

5 A. I think I answered before. General Motors has a
6 lot of very smart people in their crashworthiness
7 function. They know how load-limiting retractors
8 work and they know that function of the limiting
9 retractor. So did we actively tell them, no, but
10 they know that.

11 Q. So the answer to my question is did you tell them
12 is no?

13 A. No. It's correct; it's no.

14 Q. And you just relied on GM to know what you had
15 and to know what could be done.

16 A. They are designing the restraint system. Yes,
17 they know.

18 Q. Does Autoliv send GM advertisements, catalogs, or
19 any kind of material to tell GM what the options
20 are in the -- for the seat belt system?

21 A. We don't publish catalogs or advertise. If a
22 customer is interested in a technology, they
23 typically arrange a technology review meeting.
24 And your follow-up question was did we ever have
25 a technology review meeting, and I'm sure we did.

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1 I couldn't tell you exact time or date or who was
2 there, but I'm certain that we do, we do that on
3 a regular basis with all our customers.

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16 Q. Now, tell the jury what a Z-type retractor was.

17 A. A Z-type retractor? Autoliv many years ago had a
18 joint venture with a Japanese seat belt company
19 called NSK. Over the years, Autoliv actually
20 purchased NSK. One of the NSK retractor types
21 was what they called a Z-type retractor.

22 Q. And you told us the history of the Z type, but
23 you didn't tell me what the Z-type retractor is.

24 A. It's capable of load limiting and stopper
25 function.

0174

1 Q. And that was something Autoliv had available in
2 2006 when GM was designing the 2008 to 2012 Chevy
3 Malibu?

4 A. Correct.

5 Q. And that was something that they have for the
6 2012 Malibu, correct? Still available?

7 A. Sorry.

8 Q. The Z-type retractor was still available for the
9 2012 Malibu, correct?

10 A. Z-type retractor I think was no longer being made
11 available, but we did have other retractors with
12 stopper functions.

13 Q. So you had something with a similar function
14 then?

15 A. Correct.